Religious Representation and Economic Growth: Evidence from Indian States

Undergraduate Research Thesis

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by

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I. Abstract

In places such as India where both identity and conflict are often derived from religious affiliation, the question of how religion impacts policy is an important one. Representation in politics may improve the status of disadvantaged religious groups such as Muslims or be influenced by underlying religious beliefs. In this project, I use regression discontinuity analysis looking at narrow electoral victories to estimate the effect of electing politicians of different religious groups on economic growth. I overcome data-related challenges by using a novel method to predict politician religion from names, and by substituting traditional economic output metrics with light generated at night. I find that between 1989 and 2008, economic growth in Indian constituencies increased by 26-37% when Muslims took state-level office. These results suggest that local political representation of Muslims can have important effects for India as a whole. More broadly, this research contributes to the idea that representation of religious minority groups is integral to improving socioeconomic outcomes.

II. Introduction

The relationship between religion and economic growth has been examined since as far back as Weber's seminal theory of the Protestant work ethic. Over the past 30 years in particular, the study of religion, culture, and economic outcomes across countries within the field of economics has gained significant traction (Chen & Hungerman, 2014). Much of this interest is driven by the idea that religion and politics are often intertwined, particularly within Christianity, Judaism, and Islam (Becker et al., 2020). However, studying how religion and religiosity impact economic and social outcomes is hampered by a two-way causal relationship: whereas religion may impact individual characteristics such as incentives to work, it is also true that economic development, politics, and institutions in turn impact religious participation (McCleary & Barro, 2006). This poses a challenge for disentangling the causal impact of religious belief and affiliation from its predictors. Gathering

data that disaggregates accurately by religion is also a challenge, further hindering efforts to study the impacts of religious affiliation.

Regarding Islam, a significant area of literature in political economy focuses on the institutional effects of Islamically ruled states. For example, Kuran (2011) argued that the economic divergence between the Middle East can be explained by certain institutions in Islamic law that held the Islamic world from developing. Yet it remains unclear to what extent individual religious affiliation influences the decisions made by policymakers in secular states. Myersson (2014) studied rule by Islamic political parties in Turkey, finding that Islamic rule enables women's access to education. Barro and McCleary (2019) showed that Muslims have particularly strong beliefs in heaven and hell as well as strong religious participation, characteristics that typically correlate with economic growth. As I study here, it is possible that legislators of different faiths make different policy decisions.

Within the Indian context, there are several reasons why Muslim legislators may make different decisions than non-Muslim legislators. For one, Muslims are socioeconomically disadvantaged, discriminated against, and politically underrepresented (Asher et al., 2020). Yet evidence exists that political representation of minority groups improves social and economic status (Bhalotra et al., 2014). Consistent with existing literature on minority representation, proper representation of Muslims in politics may lead to better economic outcomes because they are more familiar with the needs of their group (Bhavnani & Lee, 2021). Members of a minority group may also hold cognitive bias in favor of their group, face pressure from members of their group, or be less likely to discriminate against their group. Bhalotra et al. (2014) most comprehensively studied the impact of Muslim legislators on social and development outcomes from the lens of minority representation. Using a regression discontinuity design, they concluded that electing Muslims to state legislatures improved infant mortality rates and educational attainment for all, with no evidence for favoritism for Muslims. Similar conclusions hold in a related body of literature where electing women to office results in enacting more women-friendly policies (Brollo & Troiano, 2016).

The prevalence of anti-Muslim discrimination may also mean that Muslims who do gain political power are more qualified than those who do not. Therefore, we may expect Muslim legislators to implement more effective policies than members of the majority Hindu group. Finally, Muslim legislators may hold different priorities than legislators of other faiths. For example, they may hold different perspectives on the role of government which manifest through policy decisions.

The question of how politician religion contributes to local economic growth in India remains relatively unexplored, but is especially relevant in the climate of polarization between political parties in India, often divided over religious lines (Mitra & Ray, 2019). My goal is to quantify the impact of local politician identity on state-level economic output, an effect that may occur through the mechanism of local policy change. I find that raising the proportion of Muslims in state-level offices stimulates economic growth. Moreover, this work can have implications for India's reservation system that establishes quotas for certain disadvantaged groups, including Muslims.

III. Background

Indian Legislature

The Constitution of India establishes the nation as a "secular, democratic republic." A federal union of 28 states and 8 union territories, India is governed by a parliamentary system, with the national legislative system composed of an upper and lower House. With 8 recognized national parties and over 40 regional parties, there is significant turnover between political parties at the national, state, and local levels.

The structure of Indian state and territory governments varies. Six states (Andhra Pradesh, Karnataka, Telangana, Maharashtra, Bihar, and Uttar Pradesh) have bicameral legislatures composed of two houses – a state Legislative Council (Vidhan Parishad) as the upper house, with the state Legislative Assembly (Vidhan Sabha) as the lower house. Five territories do not have state legislative bodies and instead are directly governed by the national government. The other 22 states and three

Union territories have unicameral governments, consisting of only a Legislative Assembly. Members of the state Legislative Assemblies (MLAs), the focus of this paper, are elected directly by their constituencies through a single-member "first-past-the-post" system. The candidate who receives the most votes in each legislative constituency is elected to serve a 5-year term in state office. There are approximately 4,000 MLAs nationwide at any given time. Because elections typically take place during the spring, MLAs who are elected to serve take office the same year the election occurs. In some cases, MLAs will elect to leave their position before the end of their term, resulting in a bye-election to fill the position.

State governments are the primary legislators with regards to social and economic issues and expenditure (Bhalotra et al., 2014). Constitutionally, MLAs hold significant control over public goods and state budgets. They also oversee how local development funds are spent and can utilize discretionary development funds within their constituencies. Moreover, MLAs exercise control over the state bureaucracy and its financial allocations. Thus, MLAs have the capacity to make policy decisions that notably impact local economic growth (Prakash et al., 2019).

Muslims in Politics

According to the 2011 Census of India, Muslims comprise the largest religious minority in India at 14.2% of the population, approximately 172 million people. A well-known 2006 report released by the Sachar committee documented the social, economic, and political inequities faced by Muslims, stating in regard to political representation that "minorities in India lack effective agency and political importance. They do not have the necessary influence or the opportunity to either change or even influence events which enables their meaningful and active participation in development process," (Sachar, 2006). At the federal level, Ghouse (2018) shows that population-wise, 57% of Muslims were not represented in India's lower house (Lok Sabha) over the 2004, 2009, and 2014 elections. Below, I document the share of Muslim MLAs out of all MLAs between 1974 and 2018.

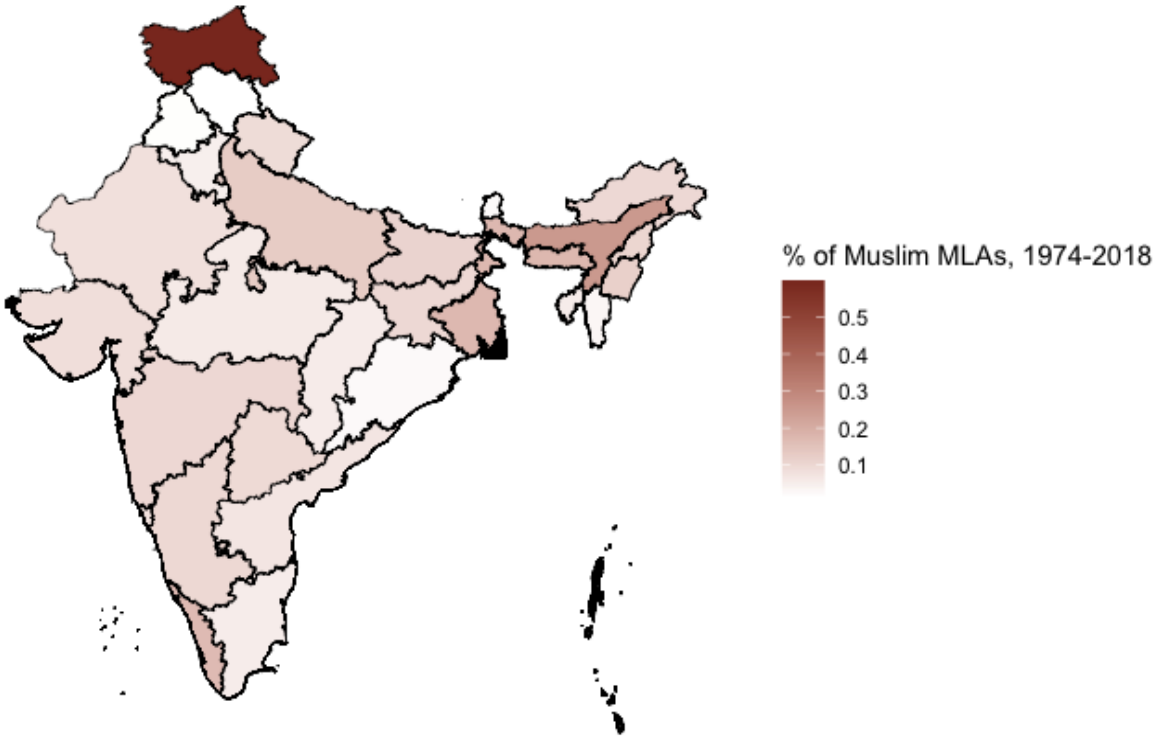

Figure 1: Map of Indian states showing the percentage of Muslim MLAs between 1974 and 2018

In order to counter the historical discrimination and absence of opportunities for minority groups, several states have at some point implemented reservations as a system of affirmative action for these groups. Up to 80% of educational opportunities and government jobs have been reserved for groups considered "backward." However, religious minorities are not always included in these groupings. Moreover, reservations are often criticized as superficial, ineffective, and most beneficial to already advantaged members of the reserved groups.

IV. Data

The SHRUG

I use data on 4,458 state-level elections from the Socioeconomic High-Resolution Rural-Urban Geographic Dataset on India (SHRUG) version 1.5 developed by Asher et al. (2019). Out of the 40,182 elections included in the SHRUG, these 4,458 were between a Muslim and a non-Muslim

– either the winning candidate was Muslim and the second-place candidate was non-Muslim, or the winning candidate was non-Muslim and the second-place candidate was Muslim. The SHRUG uniquely links Indian administrative data with external data sources to include demographic information at the towns and village level and economic indicators such as unemployment and night light emissions.

At the state legislative constituency level, the SHRUG compiles data originating from the Trivedi Center for Political Data on candidates in Indian state legislative assembly elections from 1974 to 2018. The data includes wins, losses, and election vote share. Also disaggregated to the legislative constituency level is a measure of economic growth indicated by the presence of light detected at night – a relationship that I describe in a later section. This luminosity data, recorded through high resolution images taken nightly by NASA satellites between 8:30pm and 10:00pm local time, is available annually for the years 1994 to 2013. The SHRUG can therefore be used to compare local political and economic trends for the past 44 years. An advantage of the SHRUG is that it tracks consistent spatial units even if states and constituencies have merged or fractured. Moreover, the availability of novel and highly accurate luminosity data in the SHRUG allows for a more comprehensive analysis than otherwise available through traditional markers of economic growth such as GDP.

Classifying Religion

In order to infer the likely religion of each legislative assembly election candidate, I used a name-based religion prediction algorithm developed by Chaturvedi and Chaturvedi (2020). The algorithm uses machine learning and character-based linguistic differences to predict the likelihood that a name is Muslim. Similar techniques have been used to predict demographic characteristics such as gender and ethnicity (Wood-Doughty et al., 2018). Such predictions for India are enabled by the fact that Islamic names have heavy influence from Arabic, whereas non-Islamic Indian names are most often

derived from Sanskrit. The program evaluates linguistic patterns and character usage frequency between the names – for example, the characters “P”, “V”, and “X” are highly relevant to non-Muslims, whereas “F”, “Q”, and “Z” are most common in Muslim names. The model is trained on data from India’s Rural Economic & Demographic Survey as well as a set of household names from the state of Uttar Pradesh and has 100% classification coverage.

The authors of Chaturvedi and Chaturvedi (2020) generously provided religion likelihood estimates using their single-name support vector machine (SVM) classification model. The model receives a candidate “single name” input rather than both the candidate’s and another family member’s name for additional validation. For Muslim names, the single-name SVM model had a precision (true positive rate) of over 90% for both testing datasets. It had a recall (positive detection rate) of over 81%. The precision level of this model is higher than that of a more complex neural model tested by the authors as well as a dictionary-based model relying on a pre-classified list of names. The output shows a decision function score in which observations with a score greater than 0 are classified as Muslim, and observations with a score less than 0 are classified as non-Muslim. In my dataset, all names were either Muslim or Hindu. However, it is possible Buddhist, Christian, Jain, or Sikh names were incorrectly classified as Hindu – the shared roots of these names being the source of most of the model’s incorrect predictions. Therefore, in my analysis, I identify all names as either Muslim or non-Muslim.

winner_name1	predicted_religion	muslim_score
jatin chakravarty	Hindu	-1.19884749
jatin chakraborty	Hindu	-0.94498061
kshiti goswami	Hindu	-1.25146331
sachin sen	Hindu	-0.86298400
ahmed javed khan	Muslim	1.51303118
sachin sen	Hindu	-0.86298400
aroop biswas	Hindu	-1.14448102
sachin sen	Hindu	-0.86298400
sachin sen	Hindu	-0.86298400
rabin deb	Hindu	-0.65932058
aroop biswas	Hindu	-1.14448102
rabin deb	Hindu	-0.65932058
md abu sufyan	Muslim	1.29908571
hashim abdul halim	Muslim	1.20809426
sovan chatterjee	Hindu	-1.28148996

Figure 2: Sample candidate name classification

Because the model has highest accuracy for names that include both a first and last name, I omitted 357 names that only provided one name in the dataset. I also omitted all entries in which the name was missing or recorded as “none of the above.” Several names had a score of 0 or around 0, indicating low confidence in the prediction. For increased accuracy in my analysis, I omitted the names around 0 with a Muslim score margin varying between 0.5 (resulting in n = 2,731) , 0.2 (resulting in n = 3,445), and 0.1 (resulting in n = 3,725).

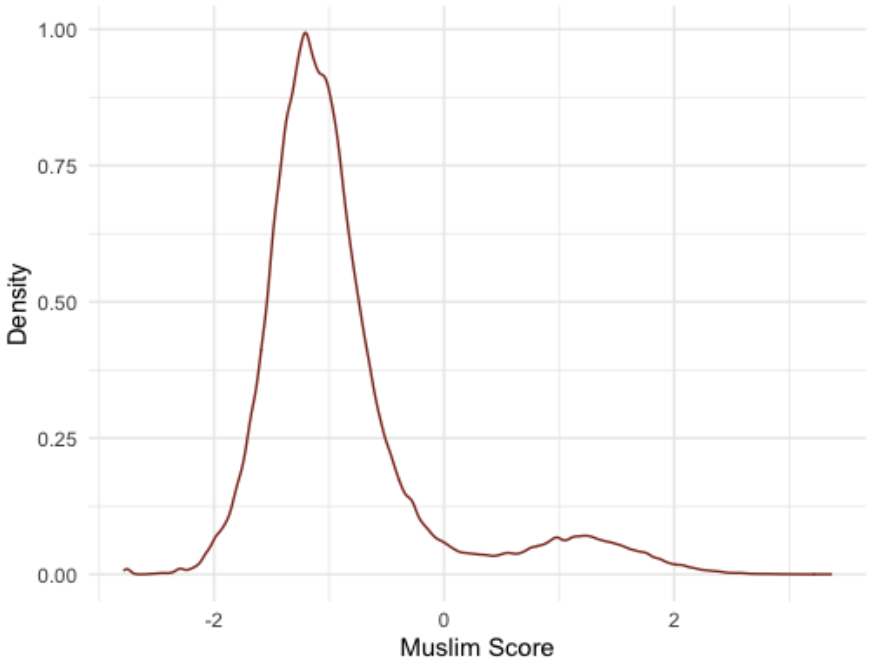

Figure 3: Density plot of religion prediction output

Luminosity and Economic Growth

Night light remote sensing data is highly correlated with national and subnational measures of economic output, including GDP and GRP (Doll et al., 2006). It measures artificial light, primarily due to electrical use, generated by businesses and human settlements that is visible from open sky. Luminosity at night is an increasingly desirable way to measure economic growth due to its ease of availability, high levels of disaggregation, and its inclusion of informal sector activity. It is most beneficial in countries like India with low-quality statistical systems but adds little value in countries where reliable data is already available (Chen & Nordhaus, 2011). Within India as well as other developing countries, the availability of luminosity data is advantageous because of the lack of spatially disaggregated data at the administrative level. Moreover, there are often significant time lags between data collection and when such administrative data is made publicly available, and reporting and weighting inaccuracies make socioeconomic indicators even more difficult to accurately track (Singhal et al., 2020). Night lights also account for activity from the shadow

economy. Administrative calculations of economic activity are often underestimated because of the magnitude of the informal sector, which does not report transactions in a systematized manner. Using satellite data therefore bypasses attempts to subvert inclusion in official estimates of GDP. Due to its time insensitivity and general inaccuracy, particularly in the developing world, an alternative to standard population and economic measures is needed.

Because of its novelty as a proxy for economic activity, luminosity data is not perfectly understood. It is also not perfectly accurate. For example, while night light data captures emissions from open spaces, it is limited in its ability to capture emissions from buildings, which are often places of high productivity. Moreover, seasonal and annual variation in night light data requires further research (Singhal et al., 2020). Luminosity is also top coded at a maximum value and suffers from inaccuracies due to "overglow," which occurs when recorded light spills over to neighboring pixels (Doll et al., 2006). The accuracy of night light data as a proxy varies by sector and region – for example, approximations tend to be overestimated in urban areas and underestimated in rural areas (Mellander et al., 2015). Some studies have found that luminosity serves as a better proxy for population density than local economic activity for developed countries (Mellander et al., 2015).

Despite these limitations, luminosity remains a robust and popular benchmark of economic growth when standard indicators are not widely available. At the legislative constituency level in India, it is difficult to find data that is geographically disaggregated enough to identify direct effects on constituencies. Identifying data reported on an annual basis presents a similar challenge. Using luminosity overcomes these challenges of completeness.

V. Methodology

A standard approach to this question would use regression analysis to measure the impact of the MLA member's religion on economic output. However, this approach is confounded by the fact that the election of a Muslim candidate to state legislature is not random. For example, states that elect

Muslim MLAs may be predisposed to doing so because of other factors. Muslims may also be more likely to run or win in certain constituencies than others.

To overcome the potential bias resulting from this challenge and identify a causal effect, I use a regression discontinuity (RD) design exploiting narrow electoral victories to estimate the effect of electing politicians of different faith groups on economic activity. In this design, it is assumed that constituencies in which Muslim candidates win by a narrow margin are comparable to constituencies in which runner-up candidates lose by a narrow margin (Imbens & Lemieux, 2008; Lee & Lemieux, 2010). Because the race is so close that it could have resulted in favor of either candidate, the actual outcome of the election is effectively random. The outcome of the election can then be attributed to chance. On average, then, the only systematic difference between these two types of candidates should be religion.

I calculated the percentage point difference between the vote shares of the first and second place candidates to find the margin of win. The variable muslim_margin is greater than 0 when a Muslim candidate won the election (n=2,044), and muslim_margin is less than 0 when the Muslim candidate lost (n=2,411). I measure the resulting difference in economic output between Muslim-represented states and non-Muslim represented states. This approach has precedent in several studies involving elections, including studies in India and studies assessing the impacts of Islamic rule (Pettersson-Lidbom, 2008; Eggers et al, 2015; Myersson, 2014; Bhalotra et al., 2014). I model my design closely after Prakash et al. (2019), who show using an RD design that electing criminally accused politicians in India significantly reduces economic output.

An important assumption of the RD model rests on the continuity of the forcing variable at the point of discontinuity (Lee & Lemieux, 2010). In this case, I show that neither Muslim nor non-Muslim politicians are more likely to win a close election. This ensures that the election results are not being manipulated by nefarious actors. The figure below shows the distribution of the forcing variable, the margin by which a Muslim candidate wins or loses, as close to symmetrical, with

candidates being approximately equally likely to win as they are to lose in close elections. It also shows the prevalence of elections with close margins as contained in the dataset.

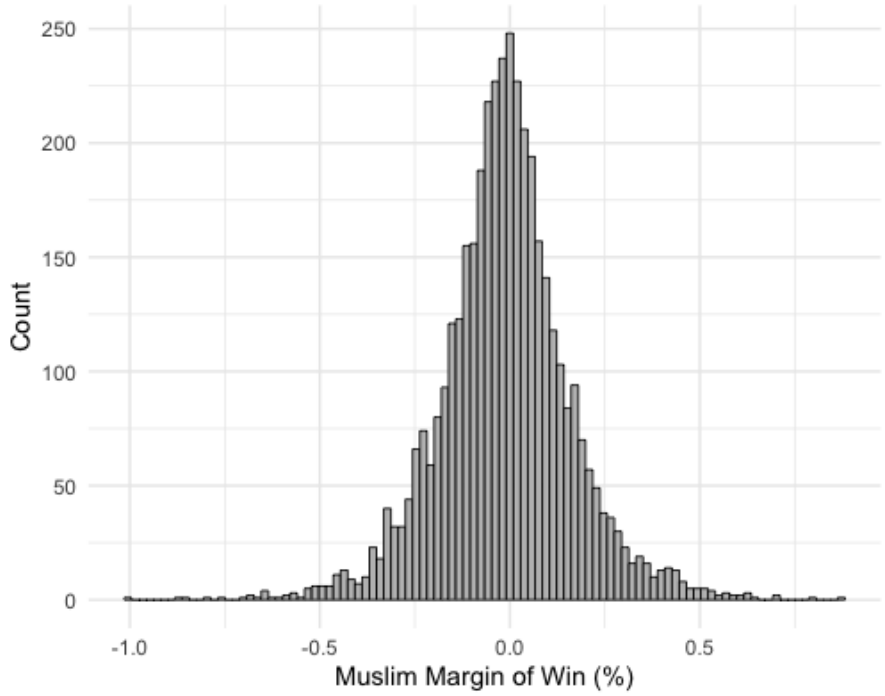

Figure 4: Plot showing continuity of the forcing variable across the threshold

The main specification is a sharp RD design taking the following form:

$$dlog(Luminosity)_c = \beta_0 + \beta_1 MuslimMLA_c + f(MuslimMargin; \theta) + \varepsilon_c$$

The outcome of interest is the change in log luminosity of constituency *c* from the beginning of the MLA's term to the end of the MLA's term. Because legislative assembly members serve a 5-year term, I calculated the change in log luminosity from the election year to 5 years after the election. This value was available only for elections from 1994 to 2008. By design, this calculation controls for constituency-level fixed effects. The independent variable MuslimMLA is a binary variable equal to 1 if the MLA member is Muslim. MuslimMargin refers to the margin of victory. Standard errors are clustered at the constituency level. I perform local linear regressions to either side

of the threshold using a triangular kernel, as recommended by Lee and Lemieux (2010). The choice of bandwidth for margin of win is somewhat arbitrary and varies across literature on elections, though Bhalotra et al. (2014) use a 2% margin and evaluate 3% in robustness checks.

To contrast the causal RD design with another approach, I also perform a regression with the same dependent variable but with fixed effects for year of election and state. This allows me to control for a greater locale than the legislative constituency.

VI. Results

The final sample contains data from 4,101 state-level legislative assembly elections between 1989 and 2008. In the table below, I describe the number of candidates, election turnout, and the constituency luminosity in the year before the election. States that elected non-Muslim MLAs are similar to states that election Muslim MLAs in all of these characteristics, indicating no preexisting differences that would bias the results.

Table 1: Summary Statistics

Non-Muslim MLA

Statistic	N	Mean	St. Dev.	Min	Max
Number of candidates in election	2,214	10.9	7.3	2	75
Election turnout	2,211	65.1	13.9	0.4	99.5
Constituency luminosity in previous year	974	10.4	14.9	0.0	63.0

Muslim MLA

Statistic	N	Mean	St. Dev.	Min	Max
Number of candidates in election	1,887	10.2	6.4	2	53
Election turnout	1,885	64.8	14.2	1.6	97.9
Constituency luminosity in previous year	867	11.3	16.3	0.0	63.0

Results from a regression with fixed effect controls for state and year show no relationship between luminosity growth as a result of electing a Muslim MLA. However, increasing the election margin of win – by electing a Muslim MLA – slightly reduces luminosity growth.

Table 2: Fixed Effects Regression Results

	(1) Luminosity Growth
Muslim MLA	0.015
	(0.032)
Margin of win	-0.003*
	(0.001)
N	1,297

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In the following RD models, the outcome variable is the percentage point change in log luminosity over the 5-year period in which the winning candidate is in office. The bandwidth refers to the margin by which the winner took office. I first examine candidates whose predicted religion fall within $-0.5 \leq$ muslim_score ≤ 0.5. Looking at election wins within a bandwidth of 1%, I find significant evidence showing that electing a Muslim MLA raises constituency-level luminosity growth by 34%. When including year and the total number of candidates in the race as covariates, I find a 37% growth. For win margins of 2% and 4%, I find consistently positive estimates of varying size. However, these estimates for more expansive bandwidths are not statistically significant.

Table 3: RD Results ($-0.5 \leq$ muslim_score ≤ 0.5)

	(1) Luminosity growth	(2) Luminosity growth	(3) Luminosity growth, with covariates	(4) Luminosity growth, with covariates
Muslim MLA	0.335*	0.119	0.373**	0.110
	(0.177)	(0.106)	(0.164)	(0.102)
N	68	142	68	142
Bandwidth	1	2	1	2
Order estimate			Local linear	
Order bias			Local quadratic	
BW estimate	1	2	1	2
BW bias	1	2	1	2

Conventional standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The following plot visualizes the jump in luminosity growth when a Muslim candidate wins. Each side of the threshold is fitted with a local linear regression. Standard errors appear as dashed lines.

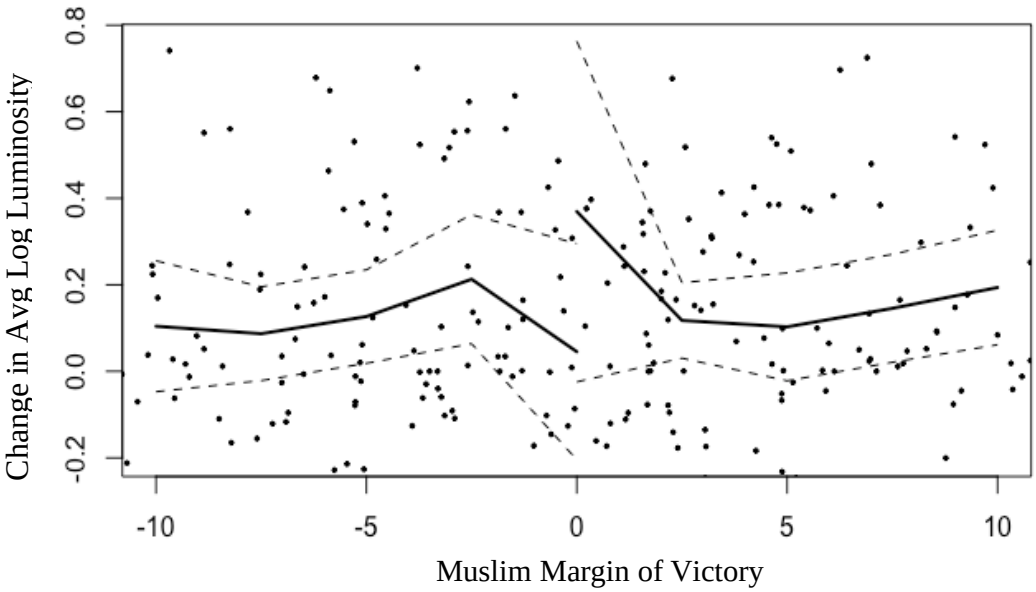

Figure 5: RD plot with local linear regressions and SEs illustrating a jump at the cutpoint

A similar plot below is smoothed by a polynomial function of order 4 as noted in Cattaneo et al. (2019). Observations are also binned by taking local averages of the datapoints.

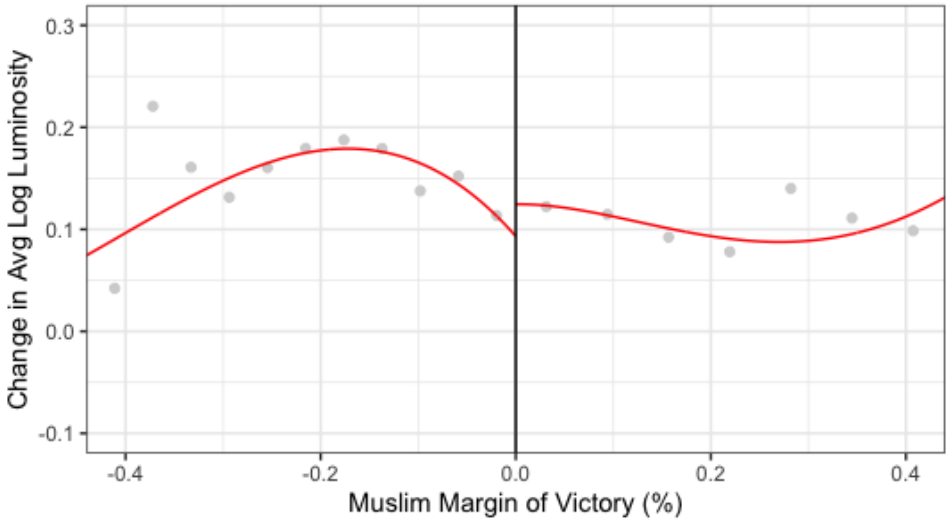

Figure 6: Smoothed RD plot illustrating a jump at the cutpoint

To check for robustness, I performed similar regressions varying the inclusion of candidates based on the confidence in their predicted religion. I broadened the sample size to include all candidates with -0.2 ≤ muslim_score ≤ 0.2 as well as with -0.1 ≤ muslim_score ≤ 0.1. At a 1% bandwidth, the results remain positive and robust at p<0.10. However, I find a lower change in luminosity growth: results indicate a 28% increase in economic activity when increasing the Muslim score bandwidth to 0.2 and 26% when increasing the bandwidth to 0.1. Results are not significant at an election win bandwidth of 2%.

Table 4: RD with Varying Religion Prediction Scores

	-0.2 ≤ muslim_score ≤ 0.2		-0.1 ≤ muslim_score ≤ 0.1	
	(1) Luminosity Growth	(2) Luminosity Growth	(3) Luminosity Growth	(4) Luminosity Growth
Muslim MLA	0.276*	0.119	0.264*	0.109
	(0.160)	(0.094)	(0.151)	(0.088)
N	80	173	88	188
Bandwidth	1	2	1	2
Order estimate	Local linear			
Order bias	Local quadratic			
BW estimate	1	2	1	2
BW bias	1	2	1	2

Conventional standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

VII. Discussion

Through the case study of India, I explore a specific mechanism by which faith interacts with economics: by influencing the decisions made by local policy makers. I use econometric analysis to answer the following question: did the religious affiliation of state level legislators in India between 1989 and 2008 significantly impact the economic output of their constituencies? Using an RD approach, I find evidence that increasing Muslim representation at the state level stimulates constituency-level economic growth between 26% and 37% at a 1% election bandwidth. Expanding

the win margin to 2% or 4% increases the sample size but also diminishes statistical significance, though the positive effects remain.

Comparing the results of a fixed effects model with the causal RD models, the fixed effects model shows no relationship between electing a Muslim MLA and luminosity change. However, a greater margin of win was associated with a .3 percentage point decline in luminosity. These findings may imply that the competitiveness of elections plays a role in determining economic outcomes. The idea that electoral competition is important is also supported by the greater precision of results when controlling for the number of candidates in RD models.

A serious challenge in accurately identifying an effect is sample size. After limiting the initial dataset to years in which luminosity data was available and matched, names for which religion predictions were relatively confident, and elections that were narrow at varying bandwidths, the final samples contained less than 100 elections across a period of 24 years. Given the limited sample as well as lack of robustness beyond a 1% margin of win, it is likely that the significant local average treatment effect I found is a weak assessment of the data. Moreover, because of the nature of the RD design, the external validity of these findings is limited (Cattaneo et al., 2019). Therefore, findings may not be predictive for elections that are not close between a Muslim candidate and a non-Muslim candidate.

A key innovation of this paper is the use of a novel name-based prediction algorithm to determine the religion of candidates for office. I found that the more cautious I was with selecting names that were most likely Muslim, the clearer the results were. This could also mean that Muslims with more recognizably Muslim names are more likely to have strong effects on economic growth. Another unique element is the choice of luminosity to measure economic output. While existing literature shows that luminosity is a good approximation for economic activity in developing countries, it is difficult to tell just how good the estimate is due to the lack of quality Indian economic data to compare it to.

It is also difficult to tell how much of the positive effects shown here can be attributed to the benefits of minority group representation versus unobservable effects associated with being outwardly Muslim. However, the knowledge that representation of Muslims has positive effects on subnational economic activity may serve as an incentive for the nation to increase affirmative action opportunities for Muslims; if not for the purpose of representation in itself, then for the purpose of stimulating economic growth.

Several areas for extension remain from this work. One alternative method of identifying causality is to incorporate a differences-in-differences model using a Muslim MLA as the treatment. Moreover, in order to fully answer the question of minority representation effects, the level of concentration of the positive effects in Muslim populations should be studied with the aid of religion data disaggregated to the level of legislative constituency. Extensions along these lines could have implications for further studies of the mechanisms underlying the individual practice of Islam as well as the influence of religion on socioeconomic outcomes.

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